

## **REMARKS**

In view of the above amendments and the following remarks, reconsideration of the objections and rejections set forth in the Office Action of May 24, 2004 is respectfully requested.

The Examiner's attention is directed to the new title presented above, which has been submitted to clearly indicate the invention to which the claims are now directed. The Examiner is respectfully requested to approve the new title.

The Examiner rejected elected claims 1-6 as being unpatentable over the Applicants' Admitted Prior Art (AAPA) in view of the Weitzel reference (USP 5,693,969). However, claims 1-6 have now been cancelled and replaced with new claims 13-16 as indicated above, and the new claims are all directed to the elected invention. For the reasons discussed below, it is respectfully submitted that new claims 13-16 are clearly patentable over the prior art of record.

Each of new independent claims 13 and 15 is directed to a pseudomorphic high electron mobility transistor including an epitaxial layer including a plurality of sequentially-stacked layers. In particular, the epitaxial layer of claim 13 includes a GaAs buffer layer, an AlGaAs buffer layer, an undoped InGaAs channel layer, a first undoped AlGaAs spacer layer, a carrier supply layer, a second undoped AlGaAs spacer layer, an undoped InGaP Schottky layer, and a doped GaAs cap layer. On the other hand, the epitaxial layer of claim 15 includes an InAlAs buffer layer, an undoped InGaAs channel layer, an undoped InAlGaAs spacer layer, a carrier supply layer, an undoped InAlAs layer, an undoped InP Schottky layer, and a doped InGaAs cap layer. Thus, the epitaxial layer of each of new independent claims 13 and 15 includes a Schottky layer including In and P. Furthermore, each of new independent claims 13 and 15 further comprises a gate electrode formed on the Schottky layer, and the main constituents of the gate electrode of each claim are La and B.

As previously noted in the Remarks submitted with the Amendment of August 24, 2004, the present invention has been developed in order to address several problems concerning conventional semiconductor devices. Firstly, the present invention provides a Schottky layer including In and P, which restrains the formation of the natural oxide film on the Schottky layer, as discussed on page 3, lines 2-5 of the original specification. Secondly, the gate electrode formed on the Schottky layer is composed of a material with the main constituents of La and B. Therefore, diffusion of the

material of the gate electrode into the Schottky layer of In and P is suppressed, so that the surface level density of the Schottky layer will be minimized, and the semiconductor device will have superior thermal stability and good Schottky characteristics.

The AAPA as illustrated in Figure 1 includes a Schottky layer 126 that includes In and P. However, the AAPA does not disclose or suggest an epitaxial layer including a plurality of sequentially-stacked layers as recited in either of new independent claims 13 and 15. Moreover, the AAPA does not disclose or suggest a gate electrode whose main constituents are La and B. Nonetheless, the Examiner notes that the Weitzel reference discloses a Schottky gate 16 that is formed of  $\text{LaB}_6$  (Lanthanum Hexaboride), and the Examiner asserts that it would have been obvious to one of ordinary skill in the art to employ the Schottky gate of the Weitzel reference as the gate electrode of the AAPA in order to increase the breakdown voltage of a FET without affecting the frequency response and the transconductance.

However, the Applicants first note that the Weitzel reference does not disclose or suggest an epitaxial layer including a plurality of sequentially-stacked layers as recited in either of new independent claims 13 and 15. Therefore, for that reason alone, one of ordinary skill in the art would not be motivated by the Weitzel reference to modify the AAPA in order to obtain the invention as recited in either of new independent claims 13 and 15.

Moreover, there is no motivation to combine the AAPA with the Weitzel reference in the manner suggested by the Examiner to obtain the present invention as recited in new independent claims 13 and 15. In particular, a gate electrode whose main constituents are La and B is employed in the present invention in order to reduce diffusion of the gate electrode material into a Schottky layer that includes *In and P*, thereby maintaining good Schottky characteristics. However, the Schottky layer 12 of the Weitzel reference is formed of *GaAs* (see column 3, lines 54-59) or *SiC* (see column 4, lines 1-8), and there is no suggestion that the Schottky layer 12 includes In and P. Thus, the problem of diffusion and the resulting decrease in the Schottky characteristics is not a concern in the invention of the Weitzel reference. As a result, the Weitzel reference would provide no motivation to use a gate electrode of La and B when such electrode is formed on a Schottky layer including In and P.

As noted above, the AAPA and the Weitzel reference do not, either alone or in combination, disclose or even suggest an epitaxial layer having a plurality of sequentially-stacked layers as recited in new independent claims 13 and 15. Furthermore, because the Schottky layer 12 of the Weitzel reference does not include In and P, there is little concern for the diffusion of the gate material into the Schottky layer 12. Therefore, it is respectfully submitted that one of ordinary skill in the art would not be motivated by the Weitzel reference to modify the AAPA so as to obtain the invention recited in new independent claims 13 and 15. Accordingly, it is respectfully submitted that new independent claims 13 and 15, and the claims that depend therefrom, are clearly patentable over the prior art of record.

In view of the above amendments and remarks, it is submitted that the present application is now in condition for allowance. However, if the Examiner should have any comments or suggestions to help speed the prosecution of this application, the Examiner is requested to contact the Applicant's undersigned representative.

Respectfully submitted,

Yoshiharu ANDA et al.

By: 

W. Douglas Mahm  
Registration No. 44,142  
Attorney for Applicants

WDH/gtg  
Washington, D.C. 20006-1021  
Telephone (202) 721-8200  
Facsimile (202) 721-8250  
February 22, 2005